



2020 MP3 Seed Grant Awards

EMORY UNIVERSITY

Project Title: Characterizing the extent and epidemiological impact of hybrid schistosomes in Tanzania.

David Civitello, PhD (Ast Prof, ECAS)
Matthew Freeman, PhD; (Asc Prof, RSPH)

Award Total: \$199,720 over 2 years

Abstract

Human schistosomes, blood flukes transmitted via freshwater snails, impose major, yet neglected human morbidity globally. Transmission occurs in ecologically complex communities and an integrative multiscale approach is needed to evaluate the drivers of transmission, develop tools for surveillance, and disrupt transmission. Recent documentation of naturally occurring hybrid schistosomes, arising from cattle- and human- specialists, overturns conventional wisdom and challenges existing control measures. Hybrids are more virulent and infectious than the parental species and can backcross and persist in humans. We will characterize the prevalence and distribution of human-cattle hybrid schistosomes, identify their drivers, and assess their relevance for schistosome eradication.

Project Title: Integration of human contact and mobility data with infection history for models of infectious disease transmission.

Benjamin Lopman, PhD (Prof, RSPH)
Ymir Vigfusson, PhD (Ast Prof, ECAS)
Jan Vinjé, PhD, (CDC)
Kristin Nelson, PhD (Ast Prof, RSPH)

Award Total: \$250,000 over 2 years

Abstract

Patterns of human contact in households, in communities, and across regions determine how infectious diseases spread and modulate the impact of control measures. However, our understanding of how human contact and mobility shape disease risk is limited. Our goal is to develop a new platform that will integrate human contact and mobility data with infection history to build tractable, realistic models of disease transmission. We will demonstrate the range and utility of this platform by modeling (1) geographic variation in rotavirus incidence post-vaccine introduction and (2) social distancing and travel restrictions to reduce spread of SARS-CoV-2.

Project Title: The role of macrophages in HIV transmission, persistence, and viral rebound post antiretroviral therapy interruption

Matthew Parsons, PhD (Ast Prof; SOM)

Mirko Paiardini, PhD (Asc Prof, SOM)

Janet McNicholl, MD (CDC)

Award Total: \$250,000 over 2 years

Abstract

HIV primarily infects CD4+ T-cells, but also infects macrophages. An understanding of the role of macrophages in HIV transmission and persistence will assist HIV vaccine and cure design. The proposed experiments use macaque SIV models of HIV exposure and persistence to assess the role of macrophages in HIV transmission, persistence during antiretroviral therapy (ART) and post-ART viral rebound. We will assess: (I) macrophage-mediated HIV transmission in the presence or absence of rectal syphilis; and (II) if latently infected macrophages reinitiate viral replication following ART cessation. Generated data will inform strategies to reduce HIV incidence through viral eradication and preventing transmission.

Project Title: Fecal Microbiota Transplantation for Multi-Drug Resistant Organism Eradication in Patients & Their Environment

Michael Woodworth, MD (Ast Prof, SOM)

Colleen Kraft, MD (Asc Prof, SOM)

Max Lau, PhD (Ast Prof, RSPH)

Award Total: \$200,000 over 2 years

Abstract

Antimicrobial resistance is an urgent threat with few effective treatments. Small, observational studies show that fecal microbiota transplantation (FMT) is up to 87.5% effective in eradicating multi-drug resistant organism (MDRO) colonization. FMT shows enormous potential as an approach to eradicate MDROs, but its mechanisms are poorly understood and its potential to reduce transmission have never been studied. This application builds a new collaboration between the Schools of Medicine and Public Health with a phase 1 trial of FMT for MDRO decolonization. This knowledge will serve as a springboard to understand mechanisms of FMT to interrupt MDRO transmission in populations.

Project Title: Characterizing molecular regulation of *Acinetobacter baumannii* phenotypes to understand its spread dynamics in a host community

Minsu Kim, PhD (Asc Prof, ECAS)

Phil Rather, PhD (Prof, SOM)

Daniel Weissman, PhD (Ast Prof, ECAS)

Nic Vega, PhD (Ast Prof, ECAS)

Award Total: \$300,000 over 2. years

Abstract

Acinetobacter baumannii is responsible for numerous outbreaks across the globe. Recently, it emerged as one of the most serious threats due to the prevalence of antibiotic resistance. We found that *A. baumannii* displays two different phenotypes specialized in host colonization and environmental persistence, respectively. The objective is to uncover how this pathogen regulates its phenotypes to spread in a host community. This objective will be pursued by using molecular genetics, single-cell fluorescence microscopy, high-throughput flow cytometry measurements of infection, and mathematical multi-scale modeling. The long-term goal of our studies is to manipulate phenotypic switching to control *A. baumannii* infections.